THE INVENTION CLAIMED IS:

1. An induction heating apparatus, comprising:

(a) a head portion, comprising: (i) an outer wall, (ii) an inner wall, (iii) an induction coil disposed between said inner and outer walls, wherein: (iv) said inner wall forms an opening having substantially a U-shape as its interior surface, and (v) said inner wall and said outer wall are substantially rigid, and do not exhibit movable portions with respect to one another; and

(b) a gripable portion, comprising: (i) an enclosure surface, (ii) an electrical switching circuit, (iii) a receiving area that receives power for energizing said induction coil, and (iv) at least one electrical conductor to carry said power between said induction coil and said receiving area.

2. The induction heating apparatus as recited in claim 1, wherein said receiving area comprises one of: (a) a receptacle; (b) at least one electrical conductor that runs through said enclosure surface; and (c) an antenna.

3. The induction heating apparatus as recited in claim 1, further comprising a mounting wall between said head portion and said gripable portion, said at least one electrical conductor running through said mounting wall.

4. The induction heating apparatus as recited in claim 1, further comprising at least one capacitor that is connected in parallel with said induction coil.

5. The induction heating apparatus as recited in claim 1, wherein said induction coil and said at least one electrical conductor comprise at least one of: (a) Litz wire; (b) electrically-conductive tubing; and (c) at least one heat pipe.

6. The induction heating apparatus as recited in claim 1, wherein said U-shaped opening is sized and shaped such that said inner wall of said head portion may be placed so as to partially surround a workpiece to be inductively heated by said induction coil.

7. The induction heating apparatus as recited in claim 6, wherein said workpiece comprises at least two elongated pipe sections that are to be soldered or brazed to form a joint; and wherein said U-shaped opening is sized and shaped such that said head portion is removed from the area of the joint without disturbing the joined pipe sections, and without requiring any portion of said induction heating apparatus to change shape.

8. The induction heating apparatus as recited in claim 1, wherein said electrical switching circuit comprises one of: (a) a finger-actuated switch, (b) a foot-actuated switch, (c) an electronic switch that is controlled by a remote device, and (d) a proximity switch.

9. The induction heating apparatus as recited in claim 1, wherein said U-shaped inner wall exhibits a substantially semi-circular shape, and said induction coil exhibits a substantially semi-circular shape.

10. An induction heating apparatus, comprising:

(a) a head portion, comprising: (i) an outer wall, (ii) an inner wall, and (iii) an induction coil disposed between said inner and outer walls, wherein said inner wall forms a surface exhibiting an opening that may be placed such that the inner wall partially surrounds a workpiece; and

(b) a gripable portion, comprising: (i) an enclosure surface, (ii) an electrical switching circuit, (iii) a receiving area that receives power for energizing said induction coil, (iv) at least one electrical conductor to carry said power between said induction coil and said receiving area; and (v) at least one heat pipe for transferring thermal energy from said head portion.

11. The induction heating apparatus as recited in claim 10, wherein said receiving area comprises one of: (a) a receptacle; (b) at least one electrical conductor that runs through said enclosure surface; and (c) an antenna.

12. The induction heating apparatus as recited in claim 10, further comprising a mounting wall between said head portion and said gripable portion, said at least one electrical conductor running through said mounting wall.

13. The induction heating apparatus as recited in claim 10, further comprising: a heat exchanger portion to assist in transferring thermal energy from said head portion.

14. The induction heating apparatus as recited in claim 13, wherein said head portion is positioned at a first end of the gripable portion at said mounting wall, said heat exchanger is positioned at an second, opposite end of the gripable portion, and said at least one heat pipe runs from said mounting wall to said heat exchanger through said gripable portion.

15. The induction heating apparatus as recited in claim 12, wherein said at least one heat pipe runs through said mounting wall and into said head portion.

16. The induction heating apparatus as recited in claim 15, wherein said at least one heat pipe is positioned within said head portion at a location in which said at least one heat pipe receives substantially minimal magnetic flux when said induction coil is energized.

17. The induction heating apparatus as recited in claim 12, wherein said at least one heat pipe runs up to said mounting wall but does not run through said mounting wall and into said head portion.

18. The induction heating apparatus as recited in claim 10, further comprising at least one capacitor that is connected in parallel with said induction coil.

19. The induction heating apparatus as recited in claim 10, wherein said induction coil and said at least one electrical conductor comprise at least one of: (a) Litz wire; and (b) electrically-conductive tubing; and (c) at least one heat pipe.

20. The induction heating apparatus as recited in claim 10, wherein said at least one heat pipe does not carry electrical power.

21. The induction heating apparatus as recited in claim 10, wherein said electrical switching circuit comprises one of: (a) a finger-actuated switch, (b) a foot-actuated switch, (c) an electronic switch that is controlled by a remote device, and (d) a proximity switch.

22. The induction heating apparatus as recited in claim 10, wherein said inner wall and said induction coil both exhibit a shape that is one of: (a) substantially semi-circular in profile; and (b) substantially semi-circular with two parallel extensions, thereby forming a U-shaped profile.

23. An induction heating apparatus, comprising:

(a) a head portion, comprising: (i) an outer wall, (ii) an inner wall, (iii) an induction coil disposed between said inner and outer walls, wherein said inner wall forms an opening that may be placed so as to partially surround a workpiece;

(b) a gripable portion, comprising: (i) an enclosure surface, (ii) an electrical switching circuit, (iii) a receiving area that receives power for energizing said induction coil, (iv) at least one electrical conductor to carry said power between said induction coil and said receptacle; and

(c) a heat exchanger portion to assist in transferring thermal energy from said head portion.

24. The induction heating apparatus as recited in claim 23, wherein said receiving area comprises one of: (a) a receptacle; (b) at least one electrical conductor that runs through said enclosure surface; and (c) an antenna.

25. The induction heating apparatus as recited in claim 23, further comprising a mounting wall between said head portion and said gripable portion, said at least one electrical conductor running through said mounting wall.

26. The induction heating apparatus as recited in claim 25, wherein:

said head portion is positioned at a first end of the gripable portion at said mounting wall, at a first side of said mounting wall; and

said heat exchanger is positioned proximal to said first end of the gripable portion, at a second, opposite side of said mounting wall.

27. The induction heating apparatus as recited in claim 26, wherein said mounting wall comprises a substance that has heat-conductive properties.

28. The induction heating apparatus as recited in claim 25, further comprising: at least one heat pipe for transferring thermal energy from said head portion; and

wherein said head portion is positioned at a first end of the gripable portion at said mounting wall, said heat exchanger is positioned at an second, opposite end of the gripable portion, and said at least one heat pipe runs from said mounting wall to said heat exchanger through said gripable portion.

29. The induction heating apparatus as recited in claim 28, wherein said at least one heat pipe runs through said mounting wall and into said head portion.

30. The induction heating apparatus as recited in claim 28, wherein said at least one heat pipe does not carry electrical power.

31. The induction heating apparatus as recited in claim 29, wherein said at least one heat pipe is positioned within said head portion at a location in which said at least one heat pipe receives substantially minimal magnetic flux when said induction coil is energized.

32. The induction heating apparatus as recited in claim 29, wherein said mounting wall comprises a substance that has heat-insulative properties.

33. The induction heating apparatus as recited in claim 28, wherein said at least one heat pipe runs up to said mounting wall but does not run through said mounting wall and into said head portion.

34. The induction heating apparatus as recited in claim 33, wherein said mounting wall comprises a substance that has heat-conductive properties.

35. The induction heating apparatus as recited in claim 23, further comprising at least one capacitor that is connected in parallel with said induction coil.

36. The induction heating apparatus as recited in claim 23, wherein said induction coil and said at least one electrical conductor comprise at least one of: (a) Litz wire; and (b) electrically-conductive tubing; and (c) at least one heat pipe.

37. The induction heating apparatus as recited in claim 36, wherein said at least one heat pipe carries the electrical load current of said induction coil.

38. The induction heating apparatus as recited in claim 23, wherein said electrical switching circuit comprises one of: (a) a finger-actuated switch, (b) a foot-actuated switch, (c) an electronic switch that is controlled by a remote device, and (d) a proximity switch.

39. The induction heating apparatus as recited in claim 23, wherein said inner wall and said induction coil both exhibit a shape that is one of: (a) substantially semi-circular in profile; and (b) substantially semi-circular with two parallel extensions, thereby forming a U-shaped profile.

40. A coil head for an induction heating apparatus, said coil head comprising:

(a) an outer member;

(b) an inner member, said inner member having a first arcuate surface along a first, inner side wall, and a second arcuate surface along a second, outer side wall, said first and second side walls being of a shape such that said inner member exhibits a profile that is substantially semi-circular; and

(c) an induction coil disposed between said inner and outer members, said induction coil comprising an electrical winding that is substantially arcuate of a semi-circular profile, such that it is substantially positioned along the second, outer side wall of said inner member; said induction coil exhibiting a length dimension along its substantially semi-circular profile, between a first end and a second end of said induction coil;

wherein:

when said inner member is moved proximal to a cylindrical workpiece that is to be heated, in which said cylindrical workpiece exhibits a circumference dimension along its outer surface, said length dimension of the induction coil is of a distance that is substantially one-half of said workpiece circumference dimension.

41. The coil head as recited in claim 40, wherein said length dimension of the induction coil is of a distance such that its first end substantially intersects a diametrical line that runs through a centerline of said cylindrical workpiece proximal to an outer surface at a first side of said workpiece, and its second end substantially intersects the same diametrical line proximal to said outer surface at a second, opposite side of said workpiece.

42. The coil head as recited in claim 41, wherein said length dimension of the induction coil is substantially equal to: {(an outer diameter of said cylindrical workpiece) + (2 **x** a thickness of said inner member measured from its first, inner side wall to its second, outer side wall)} **x** (π / 2).

43. The coil head as recited in claim 42, wherein said outer surface of the workpiece comes into direct contact with the first, inner side wall of said inner member.

44. The coil head as recited in claim 40, wherein said induction coil is of a racetrack configuration.

45. The coil head as recited in claim 41, wherein:

said induction coil comprises multiple individual turns;

at least one of said multiple individual turns exhibits a third end and a fourth end, its third end substantially intersects said diametrical line at a first side of said workpiece, and its fourth end substantially intersects the same diametrical line at a second, opposite side of said workpiece; and

at least one other of said multiple individual turns exhibits a fifth end and a sixth end, its fifth end does not substantially intersect said diametrical line at the first side of said workpiece, and its sixth end does not substantially intersect the same diametrical line at the second, opposite side of said workpiece.

46. The coil head as recited in claim 40, wherein said outer member at least partially covers said induction coil.

47. The coil head as recited in claim 40, wherein said induction coil exhibits a width dimension that runs substantially perpendicular to said length dimension;

wherein:

when said inner member is moved proximal to a cylindrical workpiece that is to be heated, and said cylindrical workpiece exhibits a longitudinal axis, a longitudinal portion of said cylindrical workpiece is heated to an extent along said longitudinal axis that is substantially equal to said width dimension of the induction coil.

48. The coil head as recited in claim 40, wherein said cylindrical workpiece comprises:

a cylindrical coupler of a first outer diameter and a first inner diameter, and a first longitudinal length; a first cylindrical pipe section of a second outer diameter; a second cylindrical pipe section of a third outer diameter, which is substantially equal to said second outer diameter; wherein said first inner diameter of the coupler is at least as large as said second and third outer diameters of the first and second pipe sections;

wherein:

(a) said first and second pipes sections are substantially abutted together such that their longitudinal axes are substantially co-linear, and said coupler is placed over both said first and second pipe sections;

(b) a bonding compound is introduced between said coupler and at least one of the first and second pipe sections;

(c) said coil head is placed at a position proximal to said coupler; and

(d) said induction coil is energized to heat said coupler and said bonding compound, thereby forming a bond between said coupler and said at least one of the first and second pipe sections.

49. The coil head as recited in claim 48, wherein said induction coil exhibits a coil width dimension that runs substantially perpendicular to said coil length dimension, and said

coil width dimension is greater than or equal to said first longitudinal length of the coupler, thereby allowing said induction coil to simultaneously heat the entire coupler.

50. The coil head as recited in claim 40, wherein:

said induction coil exhibits a thickness dimension that represents a distance between said outer side wall of the inner member and an inner side wall of said outer member; and

said coil thickness dimension is substantially equal to a radius of said workpiece along its outer diameter.

51. The coil head as recited in claim 40, wherein:

(a) said induction coil exhibits "X" watts of resistive losses when the coil is energized;

(b) said induction coil delivers "Y" watts of power to said workpiece when the coil is energized;

(c) an efficiency of the coil head is equal to Y divided by (X + Y); and

(d) said efficiency of the coil head is greater than 50%.

52. The coil head as recited in claim 51, wherein: said efficiency of the coil head is greater than 60%.